

CLAIMS

1. A device, comprising:

- a housing having an interior and an exterior;
- a flexible member within the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the interior of the housing;
- a fluid reservoir within the first chamber of the housing; and
- a microprobe extending from the fluid reservoir, through the flexible member and into the second chamber of the housing, the microprobe being configured to move substantially freely in three mutually perpendicular directions.

2. The device of claim 1, wherein a first end of the microprobe is in the fluid reservoir and a second end of the microprobe is capable of extending to the exterior of the housing.

3. The device of claim 1, wherein the microprobe is mechanically coupled to the flexible member.

4. The device of claim 1, wherein the microprobe comprises a needle.

5. The device of claim 1, wherein the microprobe comprises a microneedle.

6. The device of claim 1, wherein the flexible member comprises a septum.

7. The device of claim 1, further comprising a pump in fluid communication with the fluid reservoir.

8. The device of claim 7, wherein the pump is configured to draw a fluid from the microprobe into the fluid reservoir.

9. The device of claim 7, wherein the pump is configured to deliver a fluid from the fluid reservoir to the microprobe.

10. The device of claim 9, wherein the pump comprises a gas generating source.

11. The device of claim 9, wherein the pump comprises an electrochemical cell.

12. The device of claim 7, wherein the pump comprises a gas generating source.

13. The device of claim 7, wherein the pump comprises an electrochemical cell.

14. The device of claim 1, wherein the device comprises a device for delivering a fluid from the fluid reservoir to the exterior of the device via the microprobe.

15. The device of claim 1, wherein the device comprises a device for delivering a fluid to the fluid reservoir from the exterior of the device via the microprobe.

16. A device, comprising:
a housing having an interior and an exterior;
a flexible member within the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the interior of the housing;
a fluid reservoir within the first chamber of the housing; and
a microprobe extending from the fluid reservoir, through the flexible member and into the second chamber of the housing, the microprobe being configured to translate in a first direction and rotate substantially freely in plane perpendicular to the first direction.

17. The device of claim 16, wherein a first end of the microprobe is in the fluid reservoir and a second end of the microprobe is capable of extending to the exterior of the housing.

18. The device of claim 16, wherein the microprobe is mechanically coupled to the flexible member.

19. The device of claim 16, wherein the microprobe comprises a needle.

20. The device of claim 16, wherein the microprobe comprises a microneedle.

21. The device of claim 16, wherein the flexible member comprises a septum.

22. The device of claim 16, further comprising a pump in fluid communication with the fluid reservoir.

23. The device of claim 22, wherein the pump is configured to draw a fluid from the microprobe into the fluid reservoir.

24. The device of claim 22, wherein the pump is configured to deliver a fluid from the fluid reservoir to the microprobe.

25. The device of claim 22, wherein the pump comprises a gas generating source.

26. The device of claim 22, wherein the pump comprises an electrochemical cell.

27. The device of claim 24, wherein the pump comprises a gas generating source.

28. The device of claim 24, wherein the pump comprises an electrochemical cell.

29. The device of claim 16, wherein the device comprises a device for delivering a fluid from the fluid reservoir to the exterior of the device via the microprobe.

30. The device of claim 16, wherein the device comprises a device for delivering a fluid to the fluid reservoir from the exterior of the device via the microprobe.

31. A device, comprising:

- a housing having an interior and an exterior;
- a flexible member within the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the interior of the housing;
- a fluid reservoir within the first chamber of the housing;
- a flexible tube having a first end and a second end, the first end of the flexible tube being connected to the flexible member and in fluid communication with the fluid reservoir via the flexible member; and
- a microprobe connected to the second end of the flexible tube.

32. The device of claim 31, wherein the microprobe is configured to move substantially freely in three mutually perpendicular directions.

33. The device of claim 31, wherein the microprobe is configured to translate in a first direction and rotate substantially freely in plane perpendicular to the first direction.

34. The device of claim 31, wherein a first end of the microprobe is in the fluid reservoir and a second end of the microprobe is capable of extending to the exterior of the housing.

35. The device of claim 31, wherein the microprobe is mechanically coupled to the flexible member.

36. The device of claim 31, wherein the microprobe comprises a needle.

37. The device of claim 31, wherein the microprobe comprises a microneedle.

38. The device of claim 31, wherein the flexible member comprises a septum.

49. The device of claim 31, further comprising a pump in fluid communication with the fluid reservoir.

50. The device of claim 39, wherein the pump is configured to draw a fluid from the microprobe into the fluid reservoir.

51. The device of claim 39, wherein the pump is configured to deliver a fluid from the fluid reservoir to the microprobe.

52. The device of claim 41, wherein the pump comprises a gas generating source.

53. The device of claim 41, wherein the pump comprises an electrochemical cell.

54. The device of claim 39, wherein the pump comprises a gas generating source.

55. The device of claim 39, wherein the pump comprises an electrochemical cell.

56. The device of claim 31, wherein the device comprises a device for delivering a fluid from the fluid reservoir to the exterior of the device via the microprobe.

57. The device of claim 31, wherein the device comprises a device for delivering a fluid to the fluid reservoir from the exterior of the device via the microprobe.

58. The device of claim 1, wherein the microprobe is capable of moving a distance in a first direction that is at least about two percent of a distance the microprobe is capable of moving in a second direction perpendicular to the first direction.

59. The device of claim 48, wherein the microprobe is capable of moving a distance in a third direction that is at least about two percent of the distance the microprobe is capable of moving in the second direction, the third direction being perpendicular to the first and second directions.

50. The device of claim 16, wherein the microprobe is capable of moving a distance in a first direction that is at least about two percent of a distance the microprobe is capable of moving in a second direction perpendicular to the first direction.

51. The device of claim 50, wherein the microprobe is capable of moving a distance in a third direction that is at least about two percent of the distance the microprobe is capable of moving in the second direction, the third direction being perpendicular to the first and second directions.

52. The device of claim 31, wherein the microprobe is capable of moving a distance in a first direction that is at least about two percent of a distance the microprobe is capable of moving in a second direction perpendicular to the first direction.

53. The device of claim 52, wherein the microprobe is capable of moving a distance in a third direction that is at least about two percent of the distance the microprobe is capable of moving in the second direction, the third direction being perpendicular to the first and second directions.

54. A fluid delivery device, comprising:
a first housing having an interior;
a flexible member within the interior of the first housing and mechanically coupled to the first housing, the flexible member forming first and second chambers within the interior of the first housing;
a gas generator in fluid communication with the flexible member via the first chamber of the first housing;
a microprobe connected to the first housing so that when the gas generator produces a gas pressure sufficient to move the move the flexible member a portion of a fluid disposed in the second chamber is ejected via the microprobe;

a second housing in fluid communication with the first chamber of the first housing so that the second housing is capable of increasing the pressure in the first chamber of the first housing to increase a rate of fluid ejection via the microprobe.

55. A fluid delivery device, comprising:

- a housing having an interior;
- a flexible member within the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the housing;
- a microprobe connected to the housing and in fluid communication with the first chamber of the housing;
- a gas generator in fluid communication with the second chamber of the housing, the gas generator being capable of increasing the pressure in the second chamber to move the flexible member thereby ejecting a fluid disposed in the first chamber out of the housing via the microprobe; and
- a current generator in electrical communication with the gas generator, the current generator being configured so that when a current output by the current generator is varied, the gas output by the gas generator is correspondingly varied and the rate of fluid ejected by the microprobe is also correspondingly varied.

56. A fluid delivery device, comprising:

- a housing having an interior and an exterior;
- a flexible member disposed in the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the housing;
- a microprobe connected to the housing and in fluid communication with the first chamber of the housing;
- a gas generator in fluid communication with the second chamber of the housing, the gas generator being capable of increasing the pressure in the second chamber to move the flexible member thereby ejecting a fluid disposed in the first chamber out of the housing via the microprobe; and

at least one pressure relief valve in fluid communication with the second chamber of the housing, the at least one pressure relief valve being able to compensate for a difference between a pressure of the interior of the housing and a pressure of the exterior of the housing.

57. A fluid delivery device, comprising:

- a housing having an interior and an exterior;
- a flexible member disposed in the interior of the housing and mechanically coupled to the housing, the flexible member forming first and second chambers within the housing;
- a microprobe connected to the housing and in fluid communication with the first chamber of the housing;
- a gas generator in fluid communication with the second chamber of the housing, the gas generator being capable of increasing the pressure in the second chamber to move the flexible member thereby ejecting a fluid disposed in the first chamber out of the housing via the microprobe;
- a second housing;
- a diluent reservoir in the second housing;
- a piston in fluid communication with the diluent reservoir; and
- a powder chamber in fluid communication with the diluent reservoir and the first chamber of the first housing, the piston being configured so that it is capable of applying a pressure to urge a fluid from the diluent reservoir to the powder chamber, thereby mixing the fluid with a powder contained in the powder reservoir to form a mixture and to urge the mixture into the first chamber of the first housing.

58. A sensor system, comprising:

- a microprobe;
- a sensor; and
- a pump,

wherein the pump is configured to apply a suction to the microprobe so that the microprobe can withdraw a fluid from a body and pass the fluid to the sensor for detection.

59. The sensor system of claim 58, further comprising:
a flow restriction device between the microprobe and the sensor along a fluid flow path from the microprobe to the sensor; and
a re-fill device in fluid communication between the pump and the sensor along a fluid flow path from the pump to the sensor.

60. A fluid delivery device, comprising:
a housing having an interior and an exterior;
a piston in the interior of the housing;
a gas source in fluid communication with the interior of the housing, the gas source configured to exert a pressure against the piston in a first direction;
a resilient device configured to exert a pressure against the piston in a second direction opposite the first direction;
an arm;
an actuation device; and
a valve having an open position and a closed position.

61. A device, comprising:
a fluid reservoir capable of containing a fluid; and
a first drive mechanism configured to remove a predetermined amount of the fluid from the fluid reservoir when the first drive mechanism is actuated,
wherein the device is configured to prevent the first drive mechanism from being re-actuated until the predetermined amount of the fluid is removed.

62. The device of claim 61, further comprising a second drive mechanism configured to remove fluid from the fluid reservoir at a first predetermined rate.

63. The device of claim 62, wherein the first drive mechanism enables fluid to be removed from the fluid reservoir at a second predetermined rate different than the first predetermined rate.

64. The device of claim 63, wherein the second predetermined rate is higher than the first predetermined rate.

65. The device of claim 62, wherein the second drive mechanism comprises a gas generating source.

66. The device of claim 65, wherein the gas generating source is in fluid communication with a movable member.

67. The device of claim 61, wherein the first drive mechanism comprises a compressive force.

68. The device of claim 61, wherein the first drive mechanism comprises a spring.

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